

Case 394 : Narrative

Case Vehicle (A): 1999 Ford	Vehicle (B): 1999 Mercury
Type: F150 XLT, 4-door, 4x2 pickup	Type: Cougar, 2-door hatchback
Driver: 35-year-old male	Driver: 40-year-old female
CDC: 12-FZEW-5	CDC: 12-FDEW-3

SITUATION

[1](#) [2](#) [3](#) On a clear day, case vehicle (A) was traveling west at an unknown speed in the westbound lane of a two-lane, two-way, asphalt road, in a rural area. The road surface was dry, it was daylight, and the speed limit was 55 mph (89 kph). [4](#) [5](#) Vehicle (B) was traveling east at an unknown speed in the eastbound lane. Vehicle (X) was traveling west at an unknown speed in the westbound lane of the same roadway with vehicle (X)) in front of case vehicle (A). [6](#) As vehicle (X) and case vehicle (A) approached vehicle (B), the driver of case vehicle (A) decided to pass vehicle (X) and case vehicle (A) crossed the centerline and entered the eastbound lane. When the driver of vehicle (B) saw that case vehicle (A) was in the eastbound lane, [7](#) [8](#) she steered to the right and exited the south edge of the road in an attempt to avoid a collision. [9](#) At the same time, the driver of case vehicle (A) exited the south edge of the road in an attempt to avoid striking vehicle (B), [10](#) [11](#) and the two vehicles struck head on in a field to the south of the road, with the full front of vehicle (B) engaging with the right half of case vehicle (A). Both vehicles were towed from the scene.

The police accident report indicates C-level injuries for the driver of case vehicle (A) who was transported to a local hospital. The police accident report indicates A-level injuries for the driver of vehicle (B) who was transported to a trauma center by helicopter.

GENERAL VEHICLE DAMAGE AND ESTIMATED CRASH SEVERITIES

[12](#) Damage to the right front of case vehicle (A) was severe. Direct damage began at the right-front bumper corner and extended 85-cm across the front, resulting in 50-percent vehicle overlap (%VOL). The maximum crush was 114 cm and occurred at the right-front bumper corner.

[13](#) The direct damage to the front of vehicle (B) was severe and extended 135-cm across the entire front of the vehicle. The maximum frontal crush was 71 cm and occurred at the center of the front bumper. The majority of the damage was to the right and center portions of the front end, although the entire bumper and grille were crushed rearward. The right wheelbase was reduced by 26 cm and there was no change in the left wheelbase.

[14](#) [15](#) [16](#) [17](#) [18](#) [19](#) [20](#) [21](#) [22](#) [23](#) [24](#) Using the WinSMASH crash-reconstruction program and crush profiles measured for both vehicles, the following impact severities were calculated for the head-on impact:

Estimated Velocity Change - kph (mph)				

Vehicle	Variable	Total	Longitudinal	Latitudinal
Case Vehicle (A)	delta V	51 (32)	-50 (-31)	-9 (-6)
Vehicle (B)	delta V	72 (45)	-71 (-44)	13 (8)

DESCRIPTION OF DAMAGE TO CASE VEHICLE (A)

Exterior

[25](#) In the front, the majority of the damage was to the right and center portions of the front end, and the left section of the bumper was pulled out. [26](#) The right headlight assembly was broken and the grille was smashed. [27](#) There was no damage to the left headlight assembly. The hood was crushed to the rear, the damaged hood latch was jammed, [28 29](#) and both hood hinges were bent but not separated. [30](#) The rear edge of the hood was elevated but it did not contact the windshield. [31](#) The entire windshield was cracked, there was about 60% bond separation across the top and right side, and there was a small tear in the plastic interlayer in the right section of the glass.

[32](#) On the right side, the fender was crushed rearward into the right-front wheel, which was pushed rearward into the lower section of the A-pillar. [33](#) The right-front tire was flat, there was a hole in the sidewall, the tire was debanded from the rim, and the right wheelbase was reduced by 98 cm. [34](#) The lower portion of the right A-pillar was damaged and pushed rearward, causing remote buckling to the right-front door. [35 36](#) The right-front door was jammed closed and bowed out but the door-window glass was not broken. The upper portion of the right A-pillar was damaged and displaced up, causing remote buckling of the roof above the right-front door. [37](#) The right-rear door was buckled, bowed out, and jammed closed, but there was no damage to the door glass. [38](#) The forward section of the side panel of the truck bed was buckled and the lower section of the C-pillar was damaged when the truck box moved forward in the crash. [39](#) There was no damage to the right-rear wheel.

[40](#) On the left side, the fender was buckled, [41](#) there was no damage to the left-side wheels, and the left wheelbase was increased by 4 cm. [42 43](#) There was no damage to the left-side doors, the door glazing was intact, and there was no damage to the upper or lower sections of the A- and C-pillars. [44](#) There was no damage to the left side panel of the truck bed and [45](#) there was no damage to the rear of the vehicle.

Interior

[46](#) This vehicle was equipped with steering-wheel and dash-mounted frontal-impact airbags and both deployed during the frontal impact. [47](#) In the driver area, there was no damage to the steering-wheel airbag but there were bloodstains on the airbag fabric. [48](#) There was no damage to the roof, to the roof header, to the left A-pillar, or to the driver sunvisor. [49](#) There were cracks in the left portion of the windshield from external sources. [50](#) There was no damage to the steering wheel rim or hub, but [51](#) there were scuffmarks on the top left portion of the rim and the [52](#) steering column was rotated up. [53](#) There were scuffmarks on the underside of the steering column. [54](#) The upper and mid portions of the instrument panel were damaged and displaced rearward, [55](#) the plastic that covers the instruments was broken, [56](#) and the headlamp/turn-signal stalk on the left side of the steering column was broken and hanging by the electrical wires. [57](#) The knee-bolster cover was damaged and there were [58](#) scuffmarks on the left side and scuffmarks on, and a [59 60](#) dent in, the right side of the bolster cover. [61](#) The toe pan was displaced rearward, the floor was displaced up, and [62](#) the accelerator pedal was bent to the left. [63](#) There was no damage to the interior of the driver door and [64](#) there was no damage to the driver seat, although the manual seat adjuster was jammed in a mid-track position.

[65](#) In the center-front area, there was no damage to the roof or to the roof header, there were cracks throughout the center portion of the windshield, and the rearview mirror glass was broken and detached from the windshield. [66](#) The center instrument-panel cover was misaligned and displaced to the rear, the [67](#) ashtray was broken, [68 69](#) and the center armrest between the seats was displaced to the right.

[70](#) In the right-front seating area, there was no damage to the roof but there were numerous cracks throughout the right side of windshield [71](#) and the right A-pillar and windshield header were displaced to the rear. There was no damage to the dash-mounted airbag, [72](#) the instrument panel was displaced rearward, and the glove box was misaligned. [73](#) The right-front wheel was displaced through the floor pan and the toe-pan was displaced to the rear. [74](#) There was no damage to the right-front seat but the manual-seat adjuster was jammed. [75](#) The plastic on the forward section of right-front door interior panel was cracked and damaged, the door handle and armrest were broken, and the door was bowed out, but the door glazing was intact. [76](#) In the right-rear seating area, the interior of the door was deformed and bowed out, but there was no damage to the door glazing.

[77 78 79 80](#) The following intrusions were noted and measured:

Location	Component	Distance (cm)	Direction
left front	toe-pan	38	to rear
	floor	23	up
	instrument panel	3	to rear
center front	instrument panel	19	to rear
right front	right-front tire	85	to rear
	toe-pan	71	to rear
	instrument panel	31	to rear
	windshield header	13	to rear
	A-pillar	10	to rear

OCCUPANT KINEMATICS AND INJURIES

[81](#) The 178-cm, 73-kg (5-ft 10-in, 160-lb) 35-year-old male driver was using the three-point belt and the steering-wheel airbag deployed. [82](#) Webbing marks on the D-ring and [83](#) continuous loop, and [84](#) loading marks on the shoulder-belt webbing from the D-ring, indicate belt use.

During the frontal impact, the belt-restrained driver moved forward and to the right relative to the vehicle interior, into the belt restraints, the airbag, and the knee bolster. [85](#) He sustained a laceration with swelling to the lower lip, probably from contact by the deploying steering-wheel airbag. He sustained abrasions to the left shoulder, to the left side of the chest, to the right hip, and across the abdomen from loading by the shoulder and lap belts. He sustained a sprain and an abrasion to the left wrist, [86](#) possibly from contact with the plastic cover over the instrument gauges, as evidenced by the plastic being cracked, [87](#) or possibly from contact with the headlamp/turn-signal stalk, as evidenced by the stalk being broken off of the steering column. He sustained an abrasion to the right elbow from an unknown source. He sustained a contusion to the left knee, probably from contact with the steering column or the left side of the knee bolster, [88](#) as evidenced by scuffmarks on both. He sustained a contusion to the right knee, probably from contact with the knee bolster, [89 90](#) as evidenced by scuffmarks on, and a dent in, the right side of the bolster. [91 92](#) He sustained a contusion to the right heel, probably from contact with the toe-pan/floor.

The following table [93](#) and attached drawing summarize the injuries for the restrained driver.

Occupant: Driver	Age: 35 years	Gender: Male		
Restraints: 3-point belt plus steering-wheel airbag	Stature: 178 cm (5 ft, 10 in)	Mass: 73 kg (160 lb)		
Injury Description	A.I.S.	Injury Source		
—	—	Definite	Probable	Possible
Laceration and swelling, lower lip	1	—	Airbag	—
Abrasion, left shoulder	1	Shoulder belt	—	—
Abrasion, left chest	1	Shoulder belt	—	—
Contusion, anterior aspect of right hip	1	Lap belt	—	—
Contusion, across abdomen	1	Lap belt	—	—
Sprain, left wrist	1	—	—	Plastic cover over instrument gauges, headlamp/turn-signal stalk
Abrasion, left wrist	1	—	—	Plastic cover over instrument gauges, headlamp/turn-signal stalk
Abrasion, right elbow	1	Unknown	—	—
Contusion, left knee	1	—	Steering column, knee bolster	—
Contusion, right knee	1	—	Knee bolster	—
Contusion, right heel	1	—	Toe/pan/floor	—
Maximum A.I.S. Level	1	—	—	—
Injury Severity Score	2	—	—	—